VOL. IV. SEPTEMBER, 1898. No. 9.

The Forester

A monthly magazine devoted to the care and use of forests and forest trees and related subjects . . . . . .

EAST SLOPE OF CASCADE MOUNTAINS, NORTHWESTERN WASHINGTON.

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THE AMERICAN FORESTRY ASSOCIATION.

ORGANIZED APRIL, 1882.
INCORPORATED JANUARY, 1897.

The object of this Association is to promote:

1. A more rational and conservative treatment of the forest resources of this continent.
2. The advancement of educational, legislative and other measures tending to promote this object.
3. The diffusion of knowledge regarding the conservation, management and renewal of forests, the methods of reforestation of waste lands, the proper utilization of forest products, the planting of trees for ornament, and cognate subjects of arboriculture.

Owners of timber and woodlands are particularly invited to join the Association, as well as are all persons who are in sympathy with the objects herein set forth.

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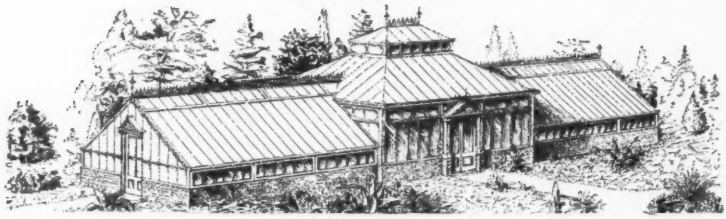

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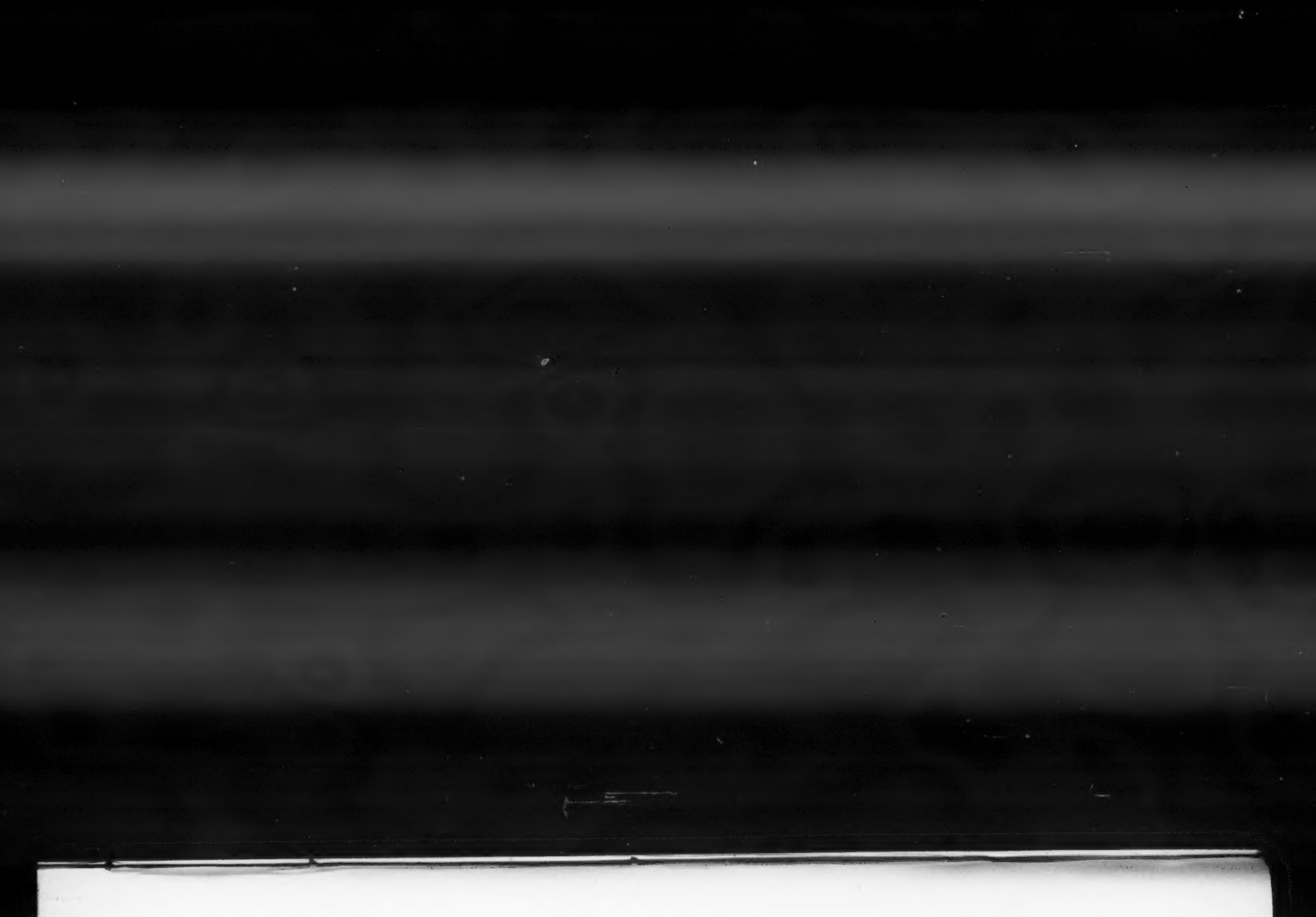

The Forester.

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A Word of Explanation.

THE FORESTER owes an apology to its readers for the tardy appearance of the present number. The material was prepared in abundant season, but in sending a part of the manuscript through the mails a serious delay occurred, due to a technicality insisted upon by the registry department of the postoffice.

This issue is given up almost wholly to the report of the special summer meeting of the American Forestry Association at Boston last month, and to the presentation of two of the most important papers read there. Other papers of note are reserved, for lack of space, till the October number.

The September and October numbers will therefore be of great value in canvassing for a larger subscription list. Many persons interested in forestry do not know where to turn for literature of this sort. It should be the aim of every reader of THE FORESTER to widen its sphere of influence.

Special Summer Meeting at Boston, Mass, August 23, 24 and 25, 1898.

Pursuant to notice published in THE FORESTER, the American Forestry Association was called to order by President Appleton at Horticultural Hall, 101 Tremont Street, Boston, Mass., at 11 o'clock on August 23, 1898.

Hon. Josiah Quincy, mayor of Boston, welcomed the Association, and in well-chosen terms expressed his appreciation of the value of the forestry movement and its relation to the advancement of civilization. He hoped to see Massachusetts take an advanced position in the recognition of the great importance of this problem. He trusted that we might see an increasing interest throughout the country from year to year until we shall be free from the reproach of wasting the gift which nature has lavished upon us.

Mr. William B. de las Casas, president of the Metropolitan Park Commission, called attention to what Massachusetts is doing in making park reservations, and what it is proposed to do, and expressed the desire of the commission to make the visit of the Association a pleasant one.

On motion of Colonel French, a committee on resolutions was appointed. The chair named Messrs. French, Fernow, Fox, Manning and Olmsted.

The chair stated that the Massachusetts Horticultural Society had placed the hall at the disposal of the Association; and also that the Appalachian Mountain Club had offered the use of its rooms.

Reports from the States were then called for.

Dr. J. T. Rothrock, Commissioner of Forestry for the State of Pennsylvania, said that they had obtained all the legis-

lation necessary to lay the foundation of a forestry system in their State.

It was recognized that there could be no successful forestry administration so long as there was no protection accorded against forest fires; therefore this was the one point to which legislation was first directed. Two laws were passed, one of which makes the constables fire wardens, and charges them with the duty of summoning a posse to aid in suppressing the fires as soon as possible. There was also another law passed. This makes it the duty of the county commissioners to appoint detectives to ferret out those who create the fires. Heavy penalties attend failure to perform these duties. These laws are working well.

Any peace officer can now arrest (without a warrant having been previously obtained) a party supposed to be violating any law which exists for the protection of timber land.

We now buy up at public sale land sold by the county treasurer or commissioners for non-payment of taxes.

In addition to this there are to be purchased three reservations, one upon the headwaters of the three principal rivers of the State. Each of these reservations is to contain not less than 40,000 acres, and they will probably contain much more. Pennsylvania will have 250,000 acres toward her reservations inside of two years.

A division of forestry now exists in our State Agricultural Department. It is commending itself to the people, and it may be safely said that all of our political parties, and all of our leading newspapers, our teachers, our professional and business men are in favor of forestry protection. We believe there is no more danger of the State abandoning the forestry cause than there is of abandoning our public school system.

Col. William F. Fox, superintendent of the New York Fish and Forestry Commission, said that New York, while it has the largest city in the country, had also an immense wilderness. The forests are in two tracts, one in northern New York called the Adirondack region and the other smaller one in the Catskills. The Adirondack forest embraces 3,800,000 acres—about the area of Connecticut.

Its composition is similar to that of New England forests, being about 80 per cent broad-leaved trees—Beech, Maple and Birch. The merchantable timber is mostly Spruce and 450,000,000 feet of lumber are cut. The production of paper pulp is making serious inroads.

The State owns in the Adirondack forest about one-third, another third is owned by private clubs and the rest by lumbermen. New York is the first State to establish a forest department and this was due to the American Forestry Association. There is another department for the purchase of forest lands. Till within a few years the land was obtained by tax sales.

The State has also established a school of forestry. A tract will be shortly purchased for experimental work. The revised State constitution provides that no trees should be cut for twenty years. The State Commission has, therefore, confined itself to dealing with fires and timber thieves. Fires are now few. There is a fire warden in every town. The smoke of a fire cannot rise without being sighted by a district warden. We believe that the way to put out a fire is not to allow it to start. We have learned by experience that after a fire gets well under way it cannot be put out.

In a recent examination of candidates for a position in the forestry department the question was asked, "What should be done with a fire not under control?" One man answered, "Trust in God and pray for rain"

The new State school of forestry at Cornell is under the charge of Dr. Fernow, and that is a guarantee of its success. On the experimental tract there is a large amount of virgin timber which is expected to furnish a perpetual revenue to the State. We cannot hope

to accomplish all that is accomplished abroad, because there are certain difficult conditions here which we must control.

The chair then called upon Dr. C. A. Schenck, of Biltmore, N. C., who said:

"It is hard to distinguish between forests and parks. Forestry, as applied to forests, is a financial question. We can never have it applied to large areas unless it pays. Private persons can do it even if it does not pay, but not the State. It would seem that as yet in this country it will not pay. Fires and taxes prevent it. We must have laws to regulate this, otherwise I am afraid we cannot have any forestry of a private nature. It is hard to make forestry pay at Biltmore. Pasturing cattle and fires for many years have deteriorated the land. It is to be remembered that besides buying the land there must be other investments, such as buildings, roads, tools, etc. So forestry will never pay very high and the rate depends upon the growth of the trees, and the trees do not grow very fast. Perhaps four per cent is all that can be gotten. The financial points must be the leading ones, and so we should try to get proper legislation to make it pay.

"As related to parks, forestry must be considered from an æsthetic standpoint and this I need not touch upon now."

Col. J. W. French, Vice President for Massachusetts, was here called to the chair. He introduced Dr. B. E. Fernow, Dean of the New York School of Forestry, at Cornell, who said:

"I represent something that is wrong, if Dr. Schenck is right. We would not educate foresters if forestry does not pay. Now I only agree with him in part. It does not pay in certain places; but there is no business that pays everywhere. At Cornell we are going to find out whether it pays or not and that is the experiment I am directing.

"There are two branches of forestry. One is sylviculture, which anybody can practice anywhere that trees grow. It means nothing more than the production of forests, *i. e.*, wood. If you can sell the wood and make a profit, that is the other part of forestry. In the selection of an experiment station we are trying to find a place where sylviculture can be carried on without loss.

"I cannot go from here without reflecting upon the past of this Association. Fifteen years ago the word 'forestry' was a revelation to the citizens of this country. It had hardly a place in the lexicons. Nobody knew what it meant. The first direction of education was a public one, to get people acquainted with the existence of the art, and give them the idea of what it meant. This is by no means completed. Many people do not know yet what it means, even though they come to forestry meetings.

There are a few business men who are beginning to see that our forests are getting scanty and they are willing now to use technical devices to protect them. It was a good move on the part of New York to start a school of forestry, of which I hope to tell you more later on. Whether it will pay we cannot tell. I expect it will in large part, but, nevertheless, the management of these woods is the object of acquiring them.

"You have read the accounts of the technical studies of forestry to be taught in this school. It is due to this Association, and we may be proud to have accomplished so great a result in so short a time. Germany took centuries to get to such a position, it being about one hundred years since a forestry school was started in that country. The American Forestry Association has fumbled about, it is true, but it has 'got there.'"

Prof. William R. Lazenby, of the Ohio State University, said that forestry in Ohio is in a deplorable condition. He appreciated what has been done in other States, which will be an incentive to Ohio to do something along the same line.

Mr. T. S. Gold, of Connecticut, said that his State was naturally a forest country and the disposition is to return to a forest growth. But very little of it will be of value. There is a forestry as-

sociation and they hope to do something more with reference to tree planting and preservation. They are dependent upon the other States to do for them what they want done in the way of forest preservation and the conservation of waters. Anything Connecticut can do has little effect upon the water supply. He believed that instead of a worthless growth of Spruces they could substitute something that would make valuable timber.

Colonel French, for the Committee on Resolutions, presented the following note from the German Minister, and also the accompanying resolutions, which were unanimously adopted:

There is going to be an International Congress for geography in Berlin some time during the Summer of 1899, and it would seem opportune to have an International Commission meet at that time in connection with the Congress to consider the following questions:

How much wooded land is there in every country?

Who are the owners of these wooded lands?

What are the principal trees?

What are they used for?

How much lumber or products of the forest are exported and to what points?

What are the values of their products?

The German Reichs-Forstverein has taken up these questions and would be very glad to receive approving resolutions from scientific bodies in the United States and help in preparing the difficult problems for an International Congress.

HERMANN.

WASHINGTON, June 25, 1898.

WHEREAS, through the increasing consumption of forest products, the destruction of forests, and the vast extension of means of transportation, questions hitherto of restricted bearing are rapidly assuming grave international importance; and

WHEREAS, the National Forest Association of Germany has undertaken to collect throughout the world forest information and statistics of commercial importance;

Resolved, That this Association (or Society) express its deep sense of the value to mankind of the work thus begun, and pledge its countenance and support to the investigation; and

Resolved, That a committee of three be appointed by the chair to communicate these resolutions to the National Forest Association of Germany, and to take such other steps as may be necessary to carry them into effect.

Mr. E. J. Parker, of Quincy, Ill., said: "We feel the inspiration of Mr. Frederick Law Olmsted's plans for the World's Fair. The waste going on in America is appalling. I have seen it in every State and Territory. When West I greatly desired to see Mt. Ranier, but it was obscured by the smoke of forest fires. But the most appalling sight is in California, from fires due to the recklessness of hunters and others. The same thing is seen in the Yellowstone Park. A few years ago Maine sent timber to the West. Now Oregon sends timber and shingles to the East. Our forests are being rapidly denuded by fire and other causes, and I therefore sympathize with the resolution just passed."

Mr. C. S. Harrison, of Nebraska, thought the Association should bring influence to bear upon the Government to cover the plains and great waste areas with trees. Large parks should be reserved in the Rocky Mountains with fine driveways through them.

Mr. J. E. Hobbs, of Maine, was called upon, but begged to be excused from speaking.

Mr. Morton, of Plymouth, Mass., invited those who came to Plymouth to let him know, so that he might show them points of interest.

The session then adjourned to meet at the Union Station at 3.29 P. M.

Going by train to West Medford, in company with many members of the A. A. A. S., the Forestry Association at that station entered drags and drove some nine miles through the Middlesex Fells. Certain members went out earlier for the closer inspection afforded by a walking trip. The work of the Metropolitan Park Commission was pointed out en route by President Casas and other members of the commission.

After a bountiful dinner at the pleasant Langwood Hotel, the Association was called to order by President Appleton at 8.20, many guests of the hotel being present.

General Appleton said:

"The American Forestry Association has members all over the Union. As meetings are held here and there, the program is varied according to the lo-

cality. This is a unique one to-day, and I hope those who have taken it have enjoyed it.

"But I am going to ask you to listen for a few moments to Mr. William B. de las Casas, president of the Metropolitan Park Commission, who has been kind enough to guide us through the lovely park. To his courtesy and that of his secretary we are much indebted."

Mr. Casas said:

"It is a pleasure to welcome you here to what is in a certain sense our domain; though being public property it is yours as well. This reservation, with which those of you who are here are, I take it, familiar, is one of the reservations which the Commonwealth of Massachusetts is providing in this part of the State, having open spaces suitable for exercise and recreation. This work was begun but a few years ago. It was commenced by the efforts of those who are interested in this tract of land. The first work was the low tract just east of the hotel, and it was the cutting off of these trees which brought about the acute stage of agitation and the offer to procure this land for a public park. The land was given. Still, difficulty was found in securing subscriptions, and therefore the trustees felt that some other public movement was necessary to make everybody contribute through taxes. That led to the appointment of a commission and a general act under which it would be possible to secure these reservations.

"The commission has been at work since 1893. There are now some 3,200 acres open to the public in the Fells. It was taken in March, 1894, and was one of the first. But there are a number of others. The Blue Hills reservation has some 4,600 acres. That is a great hill and forest reservation, without water. Here we have 600 acres in ponds. Aside from these two, there are several smaller ones. We have also taken the shores of the Charles River for about eighteen miles, and the seashore at Revere Beach, with its great bath house. The purpose of this act has been to preserve them as nearly as possible in their natural condition. The roads are therefore temporary.

"The forestry work is, to use a common expression, conspicuous by its absence. There has been very little as yet. That arises partly from the desire not to go into elaborate work in the absence of mature plans; partly, also, from the necessities of the case, and partly from a difference among the doctors. Where they disagree, you will allow that poor commissioners may go a little slowly. We base the opening up of scenery upon the lands and the existing roads. For the present we shall merely preserve the best trees.

"The work of the commission is indicated as to be wound up within the coming year. That does not mean that the care of the reservation is to stop, but simply that the system will be complete. The commission will have selected all the wild lands, the section of river bank a long the Charles, the Mystic and the Neponset, and such stretches as may be possible along the seashore, and will have laid out boulevards between them. Some six or seven million dollars have been provided for this purpose by issuing forty-year bonds to be paid out of a sinking fund raised by a special tax. The commission has selected those places which were peculiarly dear to the people and were the spots the people enjoyed as though they belonged to them in fact."

Dr. C. A. Schenck was then introduced, and said:

"My knowledge of the reservations about Boston is limited. I have only seen them during two or three hours this afternoon. Of course, as in everything, we find good and bad combined. A great deal of the forest does not deserve the name of forest. Almost three-fourths of what I have seen were coppice. This will never develop into fine trees. I have also noticed the gypsy moth commission at work, and not with my entire approval. Another thing is the roads. I could agree that it is possible to leave the roads as they are now, but better ones should be planned. The damage

by cutting new ones will be much greater later than now. But the good points are many. The best is the splendid commission. Other good points are due to the Creator, who is the best landscape gardener. There are the ponds. There are the mixed colors of the evergreen and deciduous woods. This is an advantage which the States of the Old World will envy.

"What might be done in forestry work is first to make a working plan, in which you put down the present condition, what you want it for, and how you reach the points you are aiming at. I would try to replace the woods by a better growth. Planting will be needed where the present stand of trees is poor. What we expect to see in a forest is strength and freshness. I would, therefore, gradually, by underplanting, steadily change the condition so that after a century your people will find trees which will always be admired. Perhaps some work may be done in thinning. I would not undertake to thin them very much, but I could give those trees that have the best development a better chance, more air and space to induce them to grow more vigorously. I would not remove the bushes."

Mr. F. L. Olmsted, Jr., was next introduced. He began by saying:

"I went this afternoon with a few members of the American Forestry Association through part of this reservation, pointing out in some detail the peculiar characteristics of the vegetation and the condition. I would like to do that in a more general way now by reading a brief selection from a report made by my firm to the Commission. In any forestry operation the two important things are to know what you want to do and upon what basis you have to go. It is the confusion of methods that has done harm to forestry in this country."

Mr. Olmsted then quoted at some length from the report referred to, describing the varying scenery of the Fells and the possibilities of its development as a park."

Mr. John Woodbury, secretary of the Park Commission, then delivered an instructive and entertaining lecture on the park system, illustrated by numerous lantern slides.

At its conclusion the party returned by train to Boston.

WEDNESDAY, August 24, 1898.

The Association assembled at Horticultural Hall, expecting to hear an illustrated lecture on the new Government forest reserves by Mr. Gifford Pinchot, chief of the Division of Forestry of the Agricultural Department, but he did not appear, and so General Appleton entertained the audience by an impromptu lecture on the Yosemite Valley and the city of Boston, illustrated by lantern slides. Later in the evening word was received from Mr. Pinchot that he had been suddenly called to Porto Rico by the illness of a brother in the army.

THURSDAY, August 25, 1898.

Met at Horticultural Hall at 10 A. M.

Colonel French, for the committee, offered the following resolutions, which were unanimously adopted:

Resolved, That the thanks of the American Forestry Association are hereby presented to the Massachusetts Horticultural Society for the use of hall and other facilities for carrying on its meetings.

Resolved, That the American Forestry Association desires to express its thanks and appreciation of the courtesy of the Massachusetts Forestry Association and of the Appalachian Mountain Club in their offer of hospitalities and the use of the Club Rooms.

Resolved, That the American Forestry Association rejoices at the defeat of the attempt made in Congress last winter to abolish or diminish the National Forest Reservations set apart by President Cleveland and hereby expresses its hearty commendation of the individual Senators and Representatives by whose earnest efforts this desirable result was accomplished.

Colonel French then took the chair.

Dr. B. E. Fernow read a paper entitled "The New York State College of Forestry."

Prof. William R. Lazenby read a paper on "The Need of Forestry Experiment Stations."

Papers by Mr. Allen Chamberlain on "Means Which a Forestry Association Can Employ to Advance Practical Forestry," and by Prof. W. J. Beal, of Michigan, on "The Next Move in Favor of Forestry in Michigan," were read by title.

The Chair then called upon Mr. W. W. Ashe, State Forester of North Carolina, who said:

"The State of North Carolina has no forestry fund. We intend to secure the adoption of a law like those in Pennsylvania for the stopping of forest fires. The sentiment of the public is against stopping the fires. The great majority of the people would rather burn the woods to get pasture. Pine lands lie in the eastern part of the State. The southeastern parts have been badly damaged. There are 100,000 acres of pine land where the lumber has been cut off, and where they were cut no young seedlings have come up. The fires burn them all off. The long-leaved pine does not seed oftener than once in seven years. Sometimes, if the autumn is warm the seed will germinate in the cones. In five years after the seedling starts it grows below the surface. This is because it grows in a sandy soil and it must develop a root system. We must stop the fires to protect these young trees. The benefit from burning the land is, however, considerable. The only use the land can be put to is truck-farming or cows. The relative earning power of the land burnt to pasturage and left to woods is as follows: For pasturage the earning power is 11½ cents per acre. It takes fifty-two acres to support one head of cattle. The income from the growth of trees would probably be about 30 cents per acre, counting in the turpentine. We hope we can succeed finally in getting the land-owners to see this and put their land under some protective system."

Mr. Austin Cary, of Maine, followed. He said:

"After Dr. Fernow's elaborate program I think I can only claim to be a plain woodsman. I was brought up in it, and that determined my taking up the forestry business. The work is going on in Maine. We have a forestry commissioner whose chief business is to carry out the fire law. The fires have been greatly reduced by calling the attention of the people to them. All over the State you will find the posters. People have become careful. The State College of Agriculture does nothing that I know of. They say they have no time.

"Last spring I made an engagement with a big lumber concern to act as their forester. There are many of these big concerns at work in Maine. Some are strippers, who cut off the land as quickly as possible. Others look forward to the future. With these people, if we can work out something, it means a good deal. Such is the firm I am with. We intend to cut conservatively. We have succeeded in preventing fires. We save everything, except now and then a little bark. Last winter they issued orders to spare the undergrowth and young timber, and their agents did that pretty effectively. The timber is Spruce mixed with hardwood. In the summer our work is principally to study the land preparatory to handling it in the future. All tracts are surveyed and the manager at the office knows just how the work is going on on each tract.

"To illustrate what a man can do who sees what he can do: I was helping to explore a big tract of land for pulp mills and found that insect damage was being done to the Spruce. Later on we came to other tracts where damage some time ago had been done. This damage was within ten years. We found the timber standing and rotting. I found this insect at work in many places. My concern studies it, and the result is we go over the land and find the dead timber and turn in our crews to get it before it rots. That is what can be done by getting at the facts practically.

"The employment of a forester by the International Paper Company is a most important fact. It controls 80 per cent of the output of paper pulp. It owns hundreds of thousands of acres of

timber land, and when it saw that the protection of the forest is essential to its life it is a great point gained. Mr. Griffiths, their forester, has a great chance, and if he can show practically how these men can get more out of their lands he will do a great service to forestry."

Dr. Fernow:

"I give great credit to Mr. Cary, as being the first man to try to extend forestry among timber land owners. He has been most successful in arousing business sense among these people and I am rejoiced to see it. If he thinks my course at Cornell rather long, let me say that we have all learned a good many things that we have forgotten, yet they have all worked to give us our present experience. It will be necessary for the forestry scholar to learn a good deal in order to get judgment. Practical experience is a good teacher, but she takes a long time to teach us.

"Professor Lazenby spoke for Ohio, but I myself have been in doubt whether it was time for a forestry school. I hope I shall have as few scholars as possible, because I realize that there are few such positions to be filled, and the men to fill them must be well prepared. We stand for the ideal, and it is the proper function of a university to put the ideal high."

Dr. Fernow then pleasantly criticised the local committee for having given their guests no opportunity to express their thanks, and in a few well-chosen sentences offered the following resolutions, which were unanimously adopted by those entitled to vote for them:

Resolved, That the visiting members of the American Forestry Association hereby tender their sincere thanks to the Massachusetts committee, whose courtesy and generosity have rendered the social features of the Boston meeting so successful and enjoyable.

Resolved, That the American Forestry Association hereby expresses its deep appreciation of the courtesies so kindly extended by the Metropolitan Park Commission.

Colonel Francis, of Lowell, approved Dr. Fernow's view. He had observed in Maine the reckless use of Spruce. He thought that the inquiry into the strength of timber was very important. He was greatly interested in forestry and believed in it.

Mr. James H. Bowdich, of Boston, said:

"I feel as if I knew very little about trees, although I have had the subject before me for years. Let me give a single illustration. For some years past it has been my privilege to represent Brookline in the Committee on Trees. We do a good deal of work, and naturally thought we knew something about it. A few days ago I had quite a shock. I went to Barnstable, and noticed quite a number of trees with no tree boxes. I thought the town forester a very trustful individual. Presently I saw a placard: 'All persons are forbidden leaving horses near trees.' It seemed to me that if this was a success, it was a great improvement upon our system of wire guards. Next day I found that the forester carried a large authority, extending over seven towns. He was a bigger man than I was. My point is this: The Massachusetts Forestry Association wishes to secure information of this kind. Each of us knows something and can do something. Now if we are only wise enough we can become a useful and prosperous association. We hope the American Forestry Association will unite with the State Association."

Mr. J. C. Olmsted said he was not a forester, since that science had little or nothing to do with parks. He answered a number of questions about the park systems.

Mr. N. H. Egleston congratulated the Association upon the work it had done in the past sixteen years. He approved heartily of the establishment of a forestry school, which he considered was being undertaken under unusual advantages. He thought the agricultural experiment stations should give instructions in forestry.

Dr. Schenck then read a paper on "Forestry as Applied to Reservations used as Parks."

Mr. E. J. Parker thought that the man behind the trees must reach the man behind the plow and behind the laws. He instanced the methods of the Corn Association in getting the adoption of resolutions by State associations of farmers. He suggested the circulation of printed matter among farmers and others as to the work done in New York and other States, and the interesting of prominent citizens to write to legislators. This work must fall upon the National Association. The Executive Committee should prepare circulars to reach farmers all over the country. He hoped forest reservations would be made promptly in Porto Rico and the Philippines.

The Chair gave notice of the meeting at Omaha in September.

In response to a question by Dr. Fernow, Dr. Schenck said that he knew that in Russia there was a law exempting forest properties from taxation. It related to a treeless plain, and of freed plantations of trees thereon for forty years. It induced many people to plant trees on this plain. There is a law in Pennsylvania freeing woodlands in fifty-acre tracts. The age limit for such tree exemption should be about sixty years, at which time there will be a return.

Mr. Harrison said there was a similar law in Iowa in regard to tree-planting. He urged every one to go to the Omaha meeting. He cited an instance of the ignorance of educated men about tree-planting, and called attention to the difference between the East and the West in the matter of tree-raising.

Colonel French stated that there is a law in Massachusetts which exempts tree plantations where the land is not worth more than five dollars an acre.

Professor Lazenby said that at the last session of the Ohio Legislature a law of this kind was introduced, but failed to pass. It provided that all timber lands having trees above a certain size should be exempt, and that the planting of one acre of trees should exempt two acres from taxation. He thought the next Legislature would pass it.

The meeting adjourned.

The New York State College of Forestry.

[Read before the American Forestry Association at Boston, August, 1898.]

By B. E. Fernow, Director.

Ever since the American Forestry Association was formed at Cincinnati in 1882 the need of providing for forestry education has been a favorite topic at the meetings. There were those who wished to make the subject a part of the studies in the public schools, and others who desired the establishment of special schools, either separate or in connection with other educational institutions.

Fortunately for our public schools and over-burdened school teachers, who are struggling not always quite successfully to do justice to their legitimate functions, the schemes of our enthusiastic forestry reformers in the first direction have not matured beyond the introduction of an Arbor Day celebration, perhaps an occasional reading or talk, quite sufficient to call attention of the young mind to the existence and significance of the subject.

Those who had higher aims and expected that the existence of technically educated foresters would pave the way to the application of their art, contemplated in their philanthropic desires the sacrifice of the individual to the cause; for unless the students issuing from such forestry schools had other means of subsistence, their bread, if they could earn it, would hardly have been buttered through their knowledge of forestry.

It may be set down as an axiom, that the employment of any specialist in a technical art comes, as a rule, when the economic conditions are ripe for such employment.

In the United States the exploitation of all resources has, as in every newly-settled country, been carried on without the technically educated specialist; until 1870 or thereabout mining engineers were a rarity, and the exploitation of the soil by agriculture has only just begun

to be considered an art; agricultural rapine is still largely the practice, just as the natural resources of the forest are and will be still for some time the object of the lumberman's rapine.

When has the time for a change come? When does it become necessary to employ skill and art in the use of our resources? These are difficult questions to answer. In a general way, from the standpoint of the individual the answer can only be one, namely, "when it pays;" a consideration of supply and market conditions determine for him when his financial interests are best subserved by the use of greater skill and knowledge. He may not always recognize the right moment, but it would be a profit calculation which would have to be employed to persuade him of its arrival.

From the standpoint of the community, the State, the financial consideration may be quite secondary; the interest in the preservation of certain favorable conditions may justify an expenditure, a sacrifice of the present for the sake of the future.

It was the recognition that such an interest existed, which induced the State of New York to take a first step with regard to her forest resources thirteen years ago by ceasing to dispose of the forest lands which the State had unwillingly acquired through non-payment of taxes by the owners. A further recognition of the importance of this interest followed two years ago by establishing the policy of land purchases for the increase of this area, under which policy one million dollars was expended last year and half a million is at the disposal of the Forest Preserve Board this year, while it is expected by further purchases to increase the State forest property to three million acres, more or less. This year a further, logical step in the pursuit of this State policy was made by establishing a forestry school for the professional education of the managers of this State property and an experimental forest area, in which the method of managing the property might be developed and elaborated.

This school, the New York State College of Forestry, has the distinction of being the first institution of its kind in this country where a professional study of the whole subject of forestry in all its phases may be pursued with opportunities almost equal to the best in European forestry schools, except for the absence of object lessons, which it will take some time to create.

Thus, while the art of forestry is as yet hardly practiced, a place for the study of the science which must underlie the application of the art, is established; and this entails the moral obligation upon the State to proceed on its path to a technical management of its forest property.

We may recall that the original forestry law of New York, which was mainly drafted by the writer and passed in 1885, contemplated a technical forest management of the State property and hence had conferred upon the then established Forest Commission the right to cut and sell wood.

But no professional foresters were employed and no technical forest management was attempted; the right to cut and sell was exercised simply in selling stumpage of Spruce to lumbermen.

The public, laboring under the mistaken notion that forest preservation required cessation of all cutting of trees, and not trusting to the discretion of its officers—rightly or wrongly—attempted to remedy the absence of technical advice by inserting into the Constitution of the State a clause, which prevents all cutting of wood on State lands—a foolish provision from the forester's point of view, but perhaps from the standpoint of expediency at the time, not entirely reprehensible.

It became apparent that before a rational forest management could be secured, it was still necessary to educate the people first to a true conception of what that involves, that an object lesson was needed in order to show that forest preservation did not mean "Woodman, spare that tree," but "Woodman, cut those trees judiciously;" in other words

that forest utilization and forest preservation by means of forest reproduction were not incompatible.

Imbued with this idea the Superintendent of the reorganized or consolidated Fisheries, Game and Forest Commission in his report for 1896, suggested the establishment of such a demonstration of technical forest management.

Governor Black taking interest in the proposition, conceived the idea that such an experiment requiring a long time of continuous, unchanged policy, had best be removed from the ever-changing influences of politics and should be entrusted to a strong and stable educational institution.

This thought suggested the desirability of going a step farther, namely to provide at the same time for the education of professional foresters, the future managers of the State's forest property, when with the accomplished demonstration and the existence of competent technical advice the constitutional bar to rational forestry might be removed.

Cornell University was selected to undertake the experiment; a bill was drafted and introduced into the legislature in early February, was passed and received the Governor's signature in April, and on the 16th of that month by action of the Board of Trustees the University accepted the responsibility and established the college by election of the writer as its director

Although a State institution and as such dependent upon appropriations provided by the legislature, the College, while having its own separate faculty organization, is organically connected with the University and has the benefit of the entire apparatus of the same with the 180 or more professors and instructors, at least 30 of whom will be called upon to furnish instruction to students of the College in fundamental and supplementary sciences.

In thus connecting the forestry school with a fully equipped university the most advanced German ideas in forestry education are realized. While in that country, in which forestry is most advanced, only three of the nine higher schools of forestry are located at universities, it has become more and more apparent to the educators, even to the directors of the separate institutions, that the advantages derived from the broader education and fuller equipments of the universities far outweigh the advantages of the separate academy which were mainly seen in their location near the woods and demonstration areas. It is now recognized that with modern methods of communication the woods can be more readily reached from a railroad center; that at any rate only a limited amount of practical instruction is possible at the school, wherever situated, the practice coming preferably after a thorough theoretical instruction, and, finally, that the local isolation of the academy is a detriment both to professors and students by its mental isolation. At the university the courses in fundamental and supplementary sciences, which include mathematics, physics, chemistry, geology, botany, zoology, political economy, engineering, law, can naturally be more thoroughly provided.

For the present there are three teachers of forestry provided at the new college, namely, the director and two instructors, with the possibility of using the manager of the demonstration or college forest to assist, although the distance of the latter would make such participation of the manager in educational lines possible only during summer courses and on excursions to the school forest.

This teaching force is equal to the lowest requirements and can be satisfactory only in the beginning while the college is in its infancy. The best German institutions have four and five full professors, and only the less favored are satisfied with two full professors of forestry, who are then not burdened with administrative functions.

The University of Munich has six professors of forestry, of whom two, however, are teachers of forest botany and soil physics, which are not exactly

forestry branches, but form fundamentals to be taught in the departments of botany and geology.

A satisfactory organization which would do justice both to the teaching and the investigation work, such as is here even more needed than abroad, would require three full professors with at least two instructors or assistants corresponding to the three groups into which forestry subjects can be divided according to their bases; namely, those which are mainly based upon natural sciences and are concerned with forest crop production—silviculture, forest protection, timber physics; those which are mainly based upon mathematics and engineering knowledge and are concerned with the practical management of a forest property—forest exploitation, forest mensuration and forest regulation; those which are mainly of a philosophical character, requiring a full appreciation of all the bearings of the subject, under which head forest administration, forest valuation and statics, history, statistics and forestry politics may be grouped.

The assistants would find ample work in aiding the professors in the lecture room, on excursions or practical demonstrations and in carrying on special investigations.

In spite of the present deficiency in the faculty, which is, moreover, on account of the deficient appropriations—$10,000 for the first year—limited to the director and only one assistant professor, who acts also as forest manager, the courses of studies announced have been nevertheless made full, comprising twelve courses, the expectation being that no students for the senior year will be ready before the deficiency in the faculty may be supplied under increased appropriations.

The course of studies leading to the degree of Bachelor in the Science of Forestry has been made to cover four years, corresponding in this particular also not to the general practice but to the most advanced ideas of German educators in forestry. In this course the first two years are entirely given up to studies of the fundamental sciences, while forestry subjects and supplemental studies are left for the last two years. This arrangement has the advantage that forestry students may lay their foundations at any other institution and also, should any entering upon the course for some reason desire to abandon their purpose, they will not have wasted any time on the specialty, but find themselves prepared for any other study involving natural sciences as a basis.

The required fundamental and supplemental courses comprise altogether round 1,270 hours, to which 450 hours supplemental work are added as elective but desirable, while the forestry branches represent about 600 hours, of which 130 are optional, making an average of about 17 hours per week of required and elective work.

In the fundamental branches, botany, chemistry and geology, with allied sciences, require the foremost attention, while a considerable amount of time is given to mathematics, entomology, political economy and engineering, especially map-making and road-building. It is also proposed to add a course on pisciculture and venery, since the future forest managers, at least on the State property, will undoubtedly have charge of the taking care of fish and game, which generally or often form parts of a forest property.

While these full courses are designed to equip as completely as may be, managers of large properties on which woodcropping is to be carried on as a business, the College will also endeavor to satisfy other classes of students who desire only a more or less cursory knowledge of the subject or some of its branches, such as students of political economy, or owners of timber lands, who wish to practice at least silviculture. Finally, the requirement of the law which prescribes that the College shall impart the results of the management of the demonstration forest, will be construed to mean that the function of the College is to pull up the stumps of ignorance regarding forestry wherever

they present themselves: the University Extension spirit will prevail.

Finally it may also establish summer schools designed to educate foremen and under-foresters in the principles of forestry, an educational move which is as much needed as that for the training of forest managers, for which the College is originally designed to provide.

The one drawback under which the College will labor at first and for some time to come is the absence of object lessons in the field, the demonstration of principles applied in practice. To be sure, a demonstration area of 30,000 acres has been set aside in the Adirondacks, which will in time supply the deficiency—sooner in some directions, later in others, since results in forest management are as slow to accomplish as the slowness of the crop would lead us to expect.

Since, however, the conditions in the Adirondacks are special, not only on account of the topography and climate, but because of the few species of timber trees involved, this one demonstration area cannot suffice, and in order to get variety of conditions other areas will have to be secured.

This does not necessarily imply purchase of such areas by the State ; it will be possible by and by to secure the co-operation of private timber-land owners, who may permit the College to prepare working plans for their lands and may be willing to apply forestry principles in their management, first, in that generous spirit by which all our educational movements are supported, and finally because of the financial benefits they may derive from it.

There are now some such attempts at forest management to be found in various parts of the country which may be visited by the students during excursions in vacation time. Finally a visit to the European forests under management will be found profitable to students at the end of their studies, and with full theoretical knowledge to guide them even a brief visit will be full of interest and educational value.

The demonstration in the Adirondacks, as far as forest regulation and administration is concerned, may be made to form a pattern for almost any other region; as far as *silvicultural* methods are concerned, its teachings will be applicable not only to the entire Adirondacks, but to a large part of the New England forest areas, in which Spruce is or has been the principal timber tree.

It may be interesting and useful for a fuller conception of what is involved in forest management to point out briefly what the policy and *modus operandi* to be pursued in the school forest is to be.

The leading thought in the management of a forest property is *permanency*, for it contemplates the devotion of the soil to the continued production of a crop, which it takes a century, more or less, to mature. Hence all plans and all operations must take into consideration a long future and all preparations must be made, as for a stable, permanent conduct of a business, unlike those of the lumberman, who exploits the forest only as a speculation, who is not in the business of forest or wood production, but is a mere harvester, the difference being similar to that between the breeder of cattle and the butcher.

The first business of the forester, then, is to become thoroughly acquainted with all the details of his property. He must study its topography, with special reference to the possibilities of making every part accessible to market at any time for its various products. He must know its soil conditions to judge of the variable productiveness of each acre ; its forest conditions, to give an insight as to the kind of operations required in each part, in order that the forest may be brought into most productive condition ; its contents of merchantable material and rate of growth to determine the amount of annual harvest, which a conservative management will permit. This forest survey is made in connection with or preferably on the basis of a topographical survey.

Next comes the task of preparing the

property for an orderly and systematic business conduct by dividing it into subdivisions or compartments of smaller or larger area, business units, which may be designated by letters or numbers, just as the blocks and houses in a city, or the rooms in a hotel are numbered for convenient administration. The subdivisions, based on topography, difference of soil, forest conditions and other business and silvicultural considerations, may or may not at first be permanently designated in the forest, but finally they will be so fixed not only on the map but on the ground and possibly by opening lanes between the compartments, which are preferably so located that they can be used as roads. In the end, the ideal organized, managed forest will look not unlike a city with streets, making every part of the property readily accessible. In practice this ideal may never be quite attained and temporary means of transportation, like rope-ways, movable railways, log-slides, etc., may be substituted for the roadways, where more practicable, just as elevators supplant the stairs in the apartment and business house.

While this more or less geometrical and arithmetical basis for management is laid and partly as a result of these data collected, the general policy of management is determined upon and finally its progress is regulated by working plans—for a more distant future in general and for the nearest future in detail.

The manner in which this forest regulation proceeds may be as follows:

We have to deal in the Adirondacks with a mixed forest of hardwoods, Birch, Maple and Beech, in which Spruce forms a prominent admixture, sometimes at high elevations, the latter occupying the ground almost exclusively; and of other useful species, not merely weeds, White Pine, Fir, Cedar and Aspen occur more or less scattered or in groups.

We come to the conclusion that, all points considered, the Spruce in these mountains is the most valuable timber, with the other conifers desirable concomitants, the hardwoods, although now in preponderance, being less readily marketable; and we also consider that this relative value of the species will continue for the future, since the use of the Spruce for paper pulp, with few desirable substitutes known, promises continued market for even the inferior material.

Hence we formulate our silvicultural policy: the management is to be based for Spruce. It is to be the endeavor to change from the present condition of hardwoods with an admixture of Spruce to Spruce with an admixture of hardwoods, the admixture being considered desirable for various reasons, among which specially counts the danger to which the shallow-rooted Spruce is exposed from winds, which is alleviated by association with other species.

To carry out this policy it is evident the hardwoods must be numerically reduced, the conditions for the reproduction of Spruce made favorable and the young growth of Spruce favored by subduing its competitors—operations which require the highest skill of the silviculturist.

At the same time the administrator's care is to secure a market for the hardwoods and the means of transporting the same cheaply enough, to at least pay for their removal. In this respect it is not enough to sit still and wait for the consumer to come, but active canvass and perhaps reform in the methods of the market and the utilization of the product may be necessary. There are as wasteful methods still to be found in the market and the manufacture of wood materials as in the exploitation in the forest, and reform in the latter direction depends largely on reform in the former. A study of the market, therefore, of its requirements and possibilities of change is most essential for the successful forest manager.

A further formulation of silvicultural policy is as to the kind or system of management, under which the reproduction is to be secured. There are two general classes possible. Cutting away the old growth and planting a new crop

just as wanted appears the simplest system. Yet, aside from other flaws which adhere to this method, it would under our conditions of labor be too expensive to employ, except on such areas as are now denuded or devoid of desirable species, or else for demonstration of methods and results. In such cases other species adapted to the locality and promising both silvicultural and financial success, among which especially the White Pine, would be favored.

The other class of management for reproduction, which depends upon natural seeding from the trees on or near the area to be reproduced, offers several methods, among which the method of selection in which mature trees here and there selected through the forest, or certain parts of it, are taken resembles most the lumbermen's present method, except that he is influenced only by the marketableness of his trees, while the forester keeps foremost the benefit to the young growth that is left. This method is especially adapted to those portions which are situated on the high elevations, crags and heads and wherever it is dangerous to expose the soil. Modifications of this system, for instance one in which groups of trees are removed and the reproduction, therefore, is secured by clumps rather than single individuals, may be acceptable in other parts of the property, and finally for the sake of demonstration all other systems of management, such as the strip system, the nurse-tree system, etc., may be practiced on smaller or larger areas.

One of the most difficult and important questions to be determined, especially with regard to financial results, is the rotation, *i. e.*, the age to which the crop is to be allowed to grow before utilizing it. Unlike other crops, the harvest time of which is determined by natural limits, their ripeness, the harvest of the wood crop is not so circumscribed. There is a choice as to when to harvest it, into the making of which a number of considerations enter. First, of course, useful size is the main consideration, the production of hoop poles, hop poles, vineyard stakes, may be satisfied by a ten to twenty years' growth, railroad ties may be secured in thirty to forty years, and so on. Where reproduction from seed is expected, the age at which frequent and prolific seed production takes place, maturity in the sense accepted for animals will set the lowest limit; finally, however, since the business of forest production is mainly carried on for financial results, the financial rotation must be determined, *i. e.*, that time at which it pays best to harvest the crop. Quantity of production as well as change in quality, both of which are variable with age of the crop and market conditions, influence its choice. A series of measurements of the rate of growth of the wood crop and calculations based on them and on cost of production and administration and consideration of market requirements, present and conjectured future ones, lead to the adoption of this regulator of the time element in reproduction.

These calculations may lead us to adopt a rotation of eighty years for parts of our school forest of Spruce with hardwoods and 100 years or more for other parts; that means we would distribute our fellings in such a manner that by annually or periodically equal or nearly equal amounts we remove all the wood that has been produced during the period of 80 or 100 years respectively, taking care that as much wood is left to form what is called the normal stock of wood, the working capital of wood necessary to secure by annual accretions the most desirable and profitable production of which the property is capable.

These calculations also lead finally to the conclusion as to the amount of wood that may be annually or periodically cut without reducing the normal stock or wood capital and representing, as it were, the interest. We may, for instance, come to the conclusion that on our 30,000-acre tract an annual felling budget of 2 to 3 million feet, B. M., of logs and 8 to 10,000 cords of wood may be indicated, for which we must secure

a market. It may also be found that the working capital of wood, an accumulation of capital and interest for centuries as found in the virgin forest, is unnecessarily large, beyond the normal, and hence should, for good business reasons, be as quickly reduced as it can be done profitably, or else if we have to deal with cutover lands we may have to reduce our annual cut, saving gradually to first establish the desirable working capital.

Finally, when all these bases for operation are ascertained we may formulate the working plans and decide not only on the quantities to be cut, the operations of improvement required, the manner of conducting the whole management, but also determine in what portions of the property the principal activity is to be exercised during the first 10 or 20 years, leaving it to the future manager to modify the plans as experience and changes of condition indicate.

That a well-planned bookkeeping is necessary if we would want to know how our business progresses is self-understood. Not only is it necessary to keep those accounts of financial transactions which any business requires, but each compartment in the forest must be kept account of, with a separate ledger account to show what material it has furnished, what stock remains in it, what operations it has required and whatever position in the general scheme it takes.

A demonstration and experimental area, as the proposed school forest is to be, will, to be sure, entail many operations which in a mere business forest might be dispensed with or delayed to more opportune time. Hence its financial results on the whole may not satisfy the financier. No such experiment, it may be asserted, can be made to demonstrate the profitableness of a business, it can only serve to show methods and their results and to furnish the basis and elements for profit calculations. Nevertheless it is expected that the experiment will pay for itself, while furnishing the desirable object lessons both to the students and timberland owners, the citizens of the State of New York, owners of the great State Park, included.

When this experiment is established and has demonstrated that rational forest management is possible in this country as well as in the older countries, the constitutional bar will undoubtedly be removed and the entire State holdings placed under proper technical administration with the students from the State College of Forestry its managers.

Forestry as Applied to Reservations Used as Parks.

By C. A. Schenck, Ph. D.,

Forester to the Biltmore Estate, Forest Assessor to the Government of Hesse-Darmstadt.

In the old country, forest reserves are not, and in this new country, forest reserves will not be maintained, unless there are some returns derived from the money value of the forests. In the case of mere parks aggregating some 100 acres, the commonwealth or any other owner will often renounce money profits entirely, maintaining the area in question as a source of pleasure and recreation only. Forest reserves, however, extending over several thousand acres, will not be kept up unless there be a certainty of final, financial success in the undertaking, to be the more considerable the higher the value of the area is or becomes in the course of time.

The returns from forest reserves may consist either in a net gain obtained through sale of forest produce and from grazing, mining, hunting and fishing leases, or in the protection against financial losses inflicted by floods, inadequate water supply, etc., etc. In both cases the economic effect is positive, directly justifying the outlay necessary for the establishment of the reserve.

The management of forest reserves ought to be such as to render the re-

turns—be they money gained or money saved—as considerable as possible.

With this end in view, the very first consideration is: under what conditions, especially at what stage of capital invested, will the reserve yield the highest annual interest? A man when starting in any sort of business is faced by the question, With what amount of money invested will my business prove most profitable or furnish the highest interest?

The farmer, for instance, will ask himself: How much of the funds in my hands shall I spend for land, and how much shall I reserve for improvements, for buildings, for live stock, for machinery? The soil of the fields is not the only productive capital engaged in agriculture expected to be remunerative. There must be other kinds of capital, requiring additional investments, namely, buildings, improvements, live stock and machinery. At a certain relation between value of land and value of additional investments, depending on local conditions, the annual yield per acre reaches a maximum.

Nor can forestry be undertaken in reliance on the soil alone. There must be other agencies, additional values at work to produce the highest possible yield on every acre of land. Again, there is a certain relation between value of soil on the one side, and value of standing timbers, roads, etc., on the other side, at which the entire business will prove most remunerative. This most profitable relation must be ascertained, and the entire investment for soil and timber and roads, etc., must be shaped accordingly.

The "entire investment needed" is in some cases higher than the market price of the property; for instance, if the reserve consists of neglected woods, or if it has to be created on abandoned farm lands. In other cases it is lower; for instance, if the property is stocked with mature timber which can be disposed of at a remunerative rate.

The farmer, if he is only "long of ready money," can establish the most profitable relation between soil-capital and additional capital at once. The forester cannot as a rule; trees grow slowly, and a score of years will often elapse before forestry yields the desired interest. Even then in many cases, namely, as long as there is not enough mature timber on hand, the annual interest will wholly or partially accrue on the capital instead of being realized in cash. Most people, and Americans above all, do not care to wait a long time for returns, however good and certain they may be. Therein lies one of the reasons why forestry is so rare in the land of the stars and stripes.

The term "additional values" to be invested in forestry, may need some further consideration:

As with any operation extending over a series of years, a thorough and detailed working plan must be prepared from the start dealing with the economic conditions of the forest and showing how its resources are to be developed. The entire forest must be brought gradually to the utmost permanent productiveness. The annual expense for administration, protection and taxation is the same, whether shrubby weeds and misshaped stoolshoots are growing on the ground, or promising timber trees; hence improvement cuttings are needed, removing unhealthy and undesirable specimens so as to make room for healthy ones to be developed from self-sown seeds or to be planted by the forester. Besides, mature trees must be cut. At the same time a system of permanent outlets must be created, over which forest produce may be carried at the smallest possible expense per unit, and which, wherever necessary, may act as fire lines. At the same time they may serve administrative purposes and furnish facilities for the sportsman.

Money spent for roadmaking (together with building flumes, canals, splash-dams, slides, forest railroads) is usually the largest additional investment to be superimposed on the principal, that is, the real estate. Of course a tree has no value as long as it is out of reach. The

minutiæ of the system of permanent roads, etc., will depend entirely on local conditions.

Other considerable expenses to be incurred are for demarkation of the boundary, and for a survey of the entire district, from which a more or less exact map may be derived, according to the exigencies of local conditions.

The five heads: working plan, improvement cuttings, road building, demarkation and survey, denote the main additional investments to be made, where forestry is to be established, and these should be made in such a way and to such an extent, as to render the entire investment as profitable as possible.

The moneys received for any trees removed under the system of improvement cuttings, will, of course, reduce the total of the investments in a greater or lesser degree. Where a forest reserve contains plenty of mature trees, the additional investments required, as has been pointed out already, might even happen to be less than the value of the mature trees, so that the most profitable stage of investment ranges below the original real estate value.

In many cases the woods are so far away from civilization that even the idea of timber utilization appears to be preposterous, under the conditions prevailing at the present time. Just as preposterous, however, would it be to condemn forest management in backwoods altogether, identifying timber utilization and forestry.

It has been said, that backwoods are yielding financial returns (at least to the public) even now, not as much by money gained as by money saved, in as far as they prevent floods and secure an adequate water supply. More than that, in many cases where timber cannot be sold, fish and game raised and protected in the woods can be disposed of, by issuing hunting and fishing leases under strict regulations so as to prevent abuse. Besides, the pasture available in the backwoods may be utilized, at a certain rate of remuneration, wherever permanent damage is not to be feared from it, and under such restrictions as will warrant steady and unchecked productiveness of the ground. In the course of time, even the remote backwoods will be reached by trade routes and civilization and increased financial prosperity. Forest management in backwoods requires the same additional investments as are needed in woods within the reach of the lumberman, although improvement cuttings and road-building may be postponed for years and years.

Whatever the local conditions may be, forest management needs a well organized staff of rangers, guards or keepers in order to protect trees, game and fish; in order to control contractors and lessees; in order to superintend the crews of day-workers; in order to keep up roads and trails and fire lines, etc., etc. It is impossible to give an idea of the extent of area to be allotted to each one of them, local conditions determining the question entirely. The expense of such a staff, together with the annual amount of taxes due on the land, must also be considered as capital invested, as long as the optimum stage of productiveness is not attained.

Suppose a municipal forest is started on cut-over lands fit for tree-growth only, at an expense of $1,000,000. The working plan, to be sanctioned by the city authorities, points out what operations are necessary if the highest possible return shall be obtained from the land; it states in what succession they ought to be carried out during the "period of additional investments." These extraordinary expenses—including salaries of staff and taxes—may amount to $12,000 a year for a period of twenty years, from which sum the yield of improvement cuttings—say, $2,000 a year—may be deducted. At the close of the twentieth year the entire investment will have swollen to $2,074,814, figuring at 3 per cent compound interest. From that time on, if the working plan was well prepared and its instructions carefully followed, the forest ought to yield on an annual average, say, $62,244 net, either in cash, if enough timber has matured

in the meantime, or by the latent increment of the timber, if the woods were very poor to begin with, or else partly in cash, partly by increment.

All moneys spent on forest reserves may be secured by loans, without requiring the formation of sinking funds as far as the disbursements are wisely made with a view to the development of the financial resources of the reserves, and under the provision that the lands were originally acquired at a figure corresponding with the yielding capacity of the soil, when under forest, and not at a fancy price.

The considerations holding good for forest reserves generally, may be applied as well to forest reserves used for public recreation. A few requirements, however, are to be added in this case. One of them is of a hygienic nature, tending to emphasize the effect of the forest on public health conditions. Swamps, from which miasmas are emanating, must be drained or planted up with suitable species. The growing stock of trees must consist, to a large extent, of conifers, which by the constant action of their foliage, even during winter, exercise a beneficial effect upon the air breathed by the visitors of the forest. Roads much used by the public must be built in such a way as to reduce the formation of dust to a minimum, and where they are exposed to high winds, a shelter-belt of densely closed trees may be kept along the roads. A bench here and there will offer a rest to the weary wayfarer, and a spring yielding wholesome water will be welcome to him.

More influential than medical views are æsthetic considerations, with reference to forest reserves. They require a management tending to increase, to perpetuate and render accessible the natural beauty of the forest. Here the remark might be anticipated, that Herr von Salisch, the highest authority as to questions of forest æsthetics, condemns the term "forest reserves used as parks," claiming that it involves a contradiction in itself. He strongly advises not to take any measures, in consequence of which the forest might appear as a badly kept park. There cannot be allowed, he says, an intermediate stage between "park" and "forest reserve." In no case should forest management be upset by considerations holding good for parks only. Forest management must take its own course according to its own true principles. On the other hand—to continue quoting from Salisch's opinion—the owner of the forest is perfectly free to build roads and drives and trails and bridges and to erect ranger houses, road signs, etc., etc., in excess of the requirements of the forest as such, to suit his own purse and his own taste.

A park, to be distinctly separated from the forest, lying on the city side of it—in the case of municipal forests—is justified, as long as the woods themselves are of a very poor description.

The primary questions from the standpoint of general æsthetics as well as of forest æsthetics are these: "What is the relation of the beautiful element to the useful element? and does the appearance of the object answer the purpose for which it is meant? Does the form correspond with the inner nature of the object in question, as far as it is known to the spectator? Do all parts harmonize amongst themselves and with the object as a whole.

As regards the beauty of a forest in particular, it should be increased by increasing the impression of freshness, vigor, life and liberty and by an adequate variation of the pictures presented. As fatigue blunts the perception of the beautiful, the beauty of the forest ought to present itself conspicuously without imposing needless physical effort upon the visitor.

Animal life, especially that of the useful species, must be fostered and protected.

These leading principles of æsthetics must be studied in the case of forests used for public recreation. The system of roads, the species to be selected, the method of regeneration, of thinning and of harvesting, the age of maturity of trees and the utilization of minor forest

produce, depend to a large extent on æsthetical considerations, almost invariably coinciding as to their effect with what is advisable from a financial standpoint.

The main drives will follow such courses as to traverse the most beautiful districts of the forest. These are to be found in the depressions of valleys where there is fertility and consequently a fine development of trees.

Reasoning from a financial standpoint also, the forester will lay out his principal roads so as to follow the courses of the valleys. Hauling loads up hill must be avoided. With a view to reduce the expense of transportation, all forest produce must be carried down hill to the bottom of the main valleys and thence down the main valleys traversed by the principal forest drives.

Minor roads will either run along the slopes parallel to the valley roads, with a connection here and there leading down to the main artery, or they will run around the summit of some loftier mountain, with a loop running to the crest. The grade of the road is to be made as easy as possible and in such a way as to allow all forest produce to be carried down hill exclusively.

The landscape architect similarly will have some roads running along the slopes of the hills at an easy grade so as to offer a view into the depth of the valley and over to its opposite slope. An easy grade is advisable for landscape purposes as well, in order to make the forest more accessible to visitors.

The tree species to be favored by the forester are such as suit the different localities best and develop the most vigorous growth. On a dry ridge species will be favored which can get along with little moisture; in a swamp, such species which need or endure a great deal of moisture. A mixture of several species is advisable with a view to prevent the spread of disease and of insects. A mixture at the same time lessens the damage possibly incurred from storms or drought and it yields the largest variety of produce ready to meet all fluctuations of the lumber market.

From an æsthetic standpoint also a mixed group is desirable, here in groups and there by single individuals, so as to vary the pictures presented. The species growing best on a given place will be favored by the landscape man as well as by the forester. It would be preposterous to use the forest for a botanical exhibit of trees which are badly adapted to soil and climate.

The ground cover will be husbanded by the forester who desires to protect the fertility of the soil from drying winds and hot sun, as well as by the landscape architect who is opposed to the dreary aspect of a bare soil.

The method of regeneration is to be determined largely by the question whether the forester desires an entire or partial change of the species filling the ground. Clear cuttings over large areas are not advisable in any case. On small areas they may be tried where a light-demanding species is to be introduced. Almost invariably, however, it is preferable to allow a few mother trees to protect the young seedlings during their early life, which mother trees should be removed gradually according to the requirements of the young growth underneath, or allowed to grow up with it, forming in the course of years huge standards (standards as they are called) overtopping the lower tier of young forest.

The regeneration may be effected either by sprouts, or from self-sown seeds, or by planting seeds and seedlings from one to four years old. Regeneration from sprouts is not advisable as trees thus developed are likely to be defective and unsound. In early youth sprouts grow more rapidly than seedlings and look healthier. A decline, however, will begin say from the thirtieth or fortieth year of their lives on, and only in rare cases will they reach an age of one hundred years and timber size. The forester, as a general rule, will not use the coppicing method for the produc-

tion of timber. The landscape architect for purely æsthetic reasons objects to the coppicing practice as well. It is in itself an unnatural practice and therefore it does not befit the woods. The looks of a coppice forest are uninteresting. After a lapse of forty years they are even worse, when the shoots begin to dry or to stop growing.

Self-sown seed will be used for regeneration of a forest wherever time is no consideration. Where the ground is valuable and where a forest must be raised quickly so as not to lose the interest of the capital value of the ground, artificial planting is advisable, beginning perhaps years and years before the final removal of the crop now covering the area. Regeneration from self-sown seed on the other hand is advisable where the prices of manual labor are high and where the loss of time in starting a new crop of trees is of little consequence.

On the question of regeneration, the forester agrees with the landscape architect. Both of them dislike bare areas in the forest and both of them are anxious to regenerate gradually, be it by planting or by self-sown seed. Any sudden change of prevailing conditions is against nature. Its financial effect is disastrous and its æsthetic effect is also bad.

The forester conducts the thinnings so as to accelerate the growth of the healthiest trees which are likely to have vitality enough for a two hundred years life. Therefore, generally speaking, he will not remove the lowest trees kept under by the strongest ones and which no longer interfere with the requirements of the latter. He will—and he will do it very gradually—offer increased light to the promising trees, taking away less promising trees surrounding them and preserving the soil-protecting undergrowth.

The landscape architect can only have a similar purpose, namely, to grow as rapidly as possible trees of the best form and of the best health Of course, he will require here and there an old torso to be left, but he will strongly object to a number of misshapen trees in a forest. The forester, too, is fond of the torso and gladly grants him an extra span of life. He knows too well that this or that ancient giant is the abode of the woodpecker and of his followers, the nuthatches and tits, who are so useful in devouring millions of insects. Those venerable old trees are not only beautiful; they are endowed with considerable utility as well.

The age of maturity of trees desired by the æsthetic people finds its highest limit at the time when the trees begin to rot and to grow stag-headed. It is vigor and life that we expect from nature and what we want to see in the forest. The lowest limit of life permissible by the landscape man is the moment when the trees have had just time enough to form boles fit for the saw.

The forester for financial reasons arrives at similar conclusions. He does not allow a tree to grow too old, knowing that its timber quality is getting reduced and that its annual increment is not sufficient to pay remunerative interest on the value of the tree. On the other hand, it is impossible to grow timber ready for every use unless the trees are allowed to reach a comparatively high age. Small timber and inferior firewood is obtained from the thinnings. A good management, however, tends to produce timber and wood of all sizes and qualities, so as to be ready to meet any demands.

As has been shown, the wishes of the forester and of the landscape architect coincide almost invariably. Wishing to obtain the beautiful effect we reach the useful and good effect at the same time. In other words, forests judiciously managed so as to yield the highest returns are also those which satisfy the sense of beauty in the highest degree. For—to close with a saying of Schiller—"Nothing can be considered truly ideal but what the absolute realist would be ready to create."

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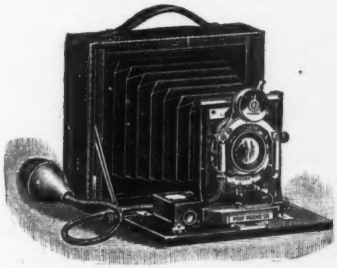

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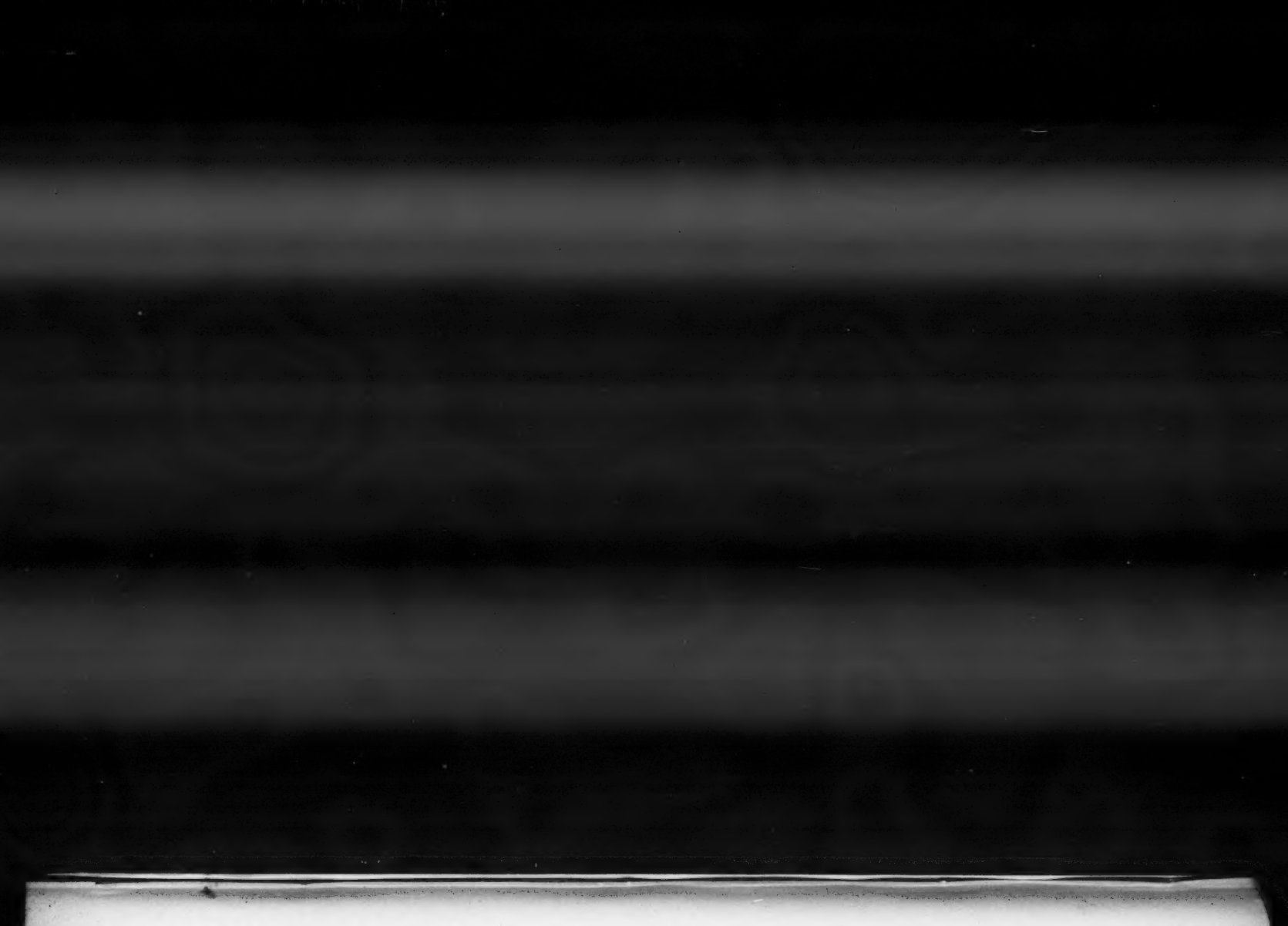

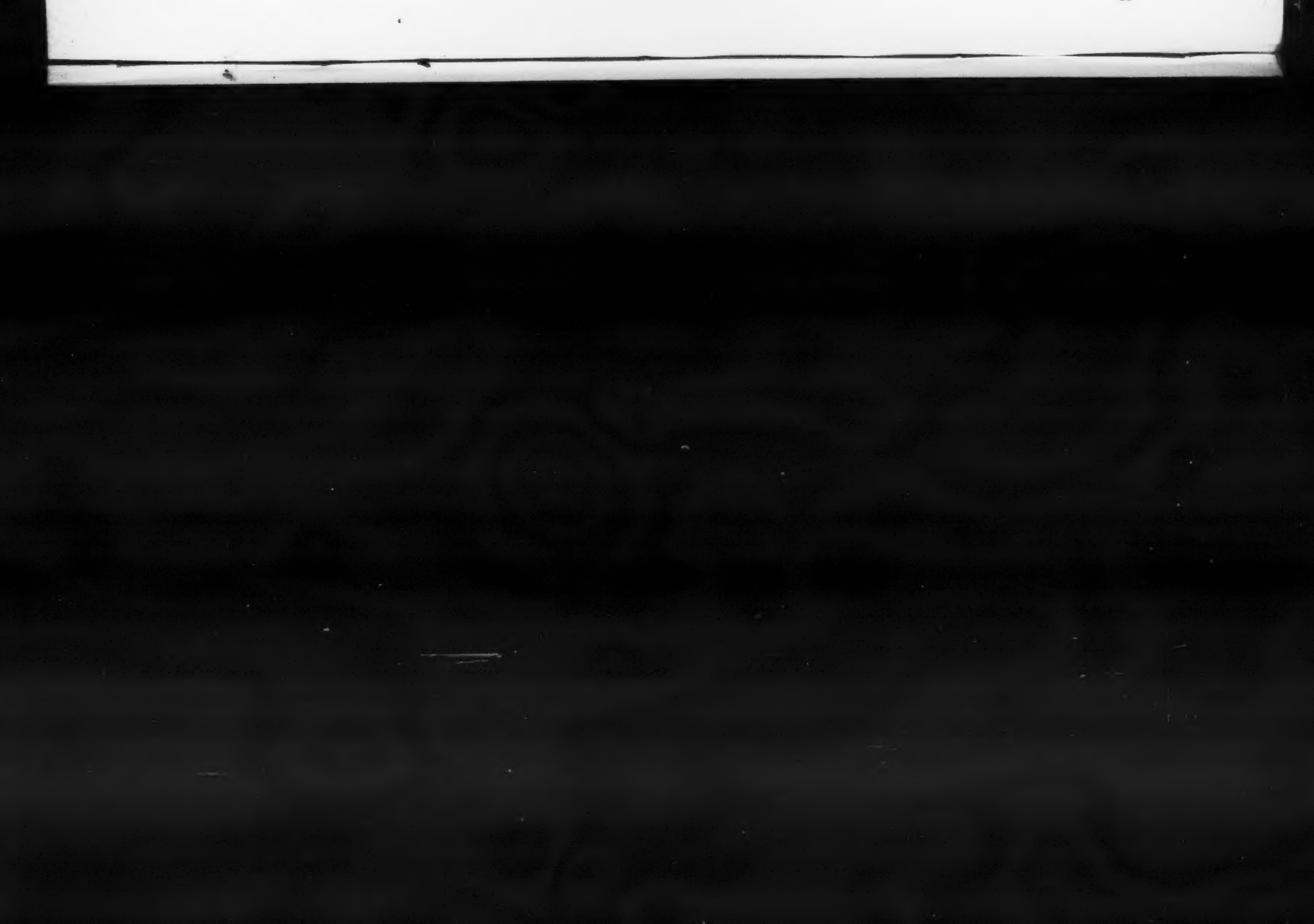

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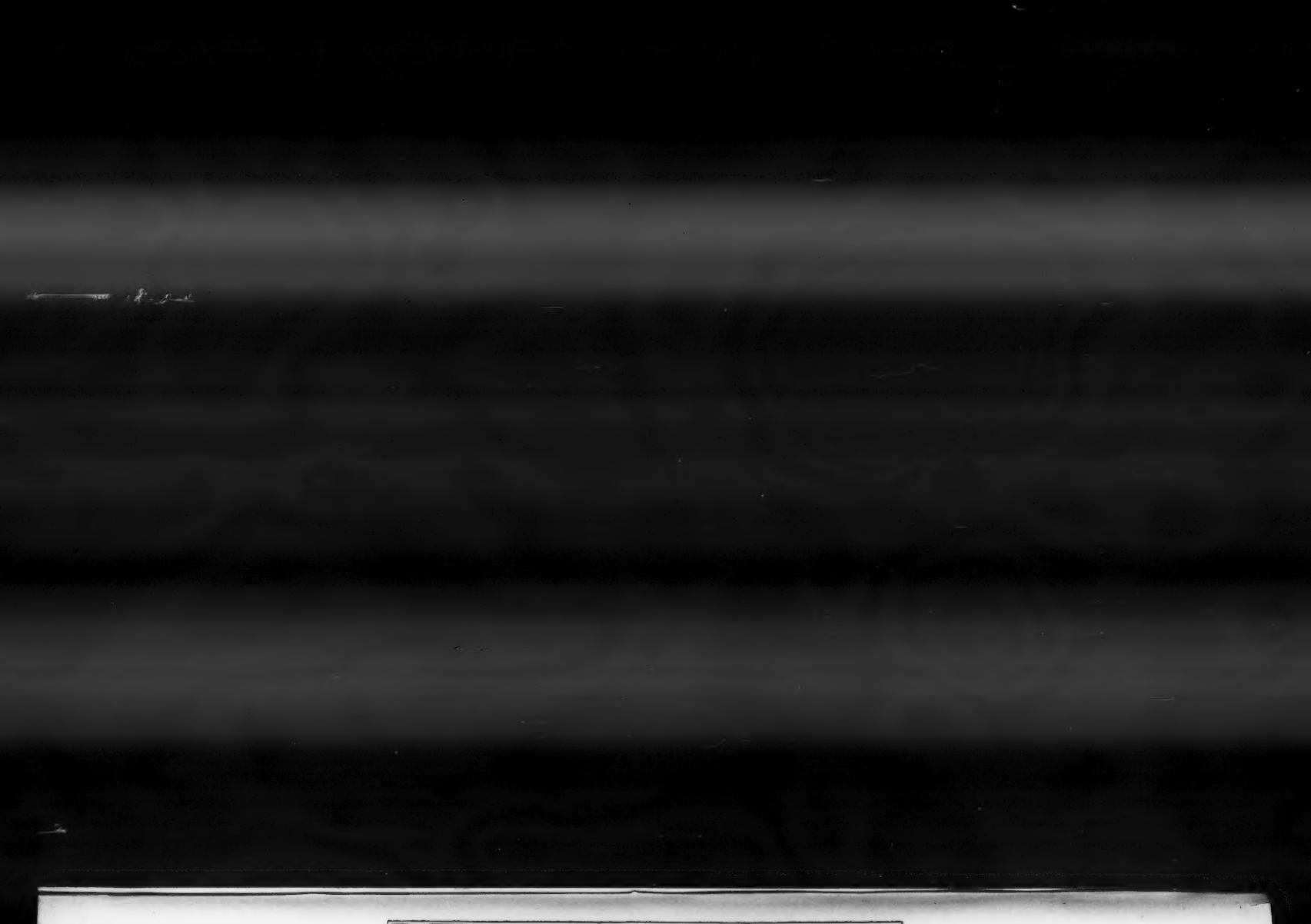
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